A Hybrid Branch & Bound Algorithm for Bound Constrained Optimization

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In this work a hybrid branch & bound algorithm is proposed for finding the global minimum of a nonlinear function with constant bound constraints. The proposed hybridization consists in finding efficient initial guesses for the classic Newton's method for unconstrained optimization, utilizing an interval branch & bound method for solving interval equations, the Hull Interval Newton method. In particular, the Hull Interval Newton method is employed for finding regions where the objective function is locally quadratic, or are near to areas where the objective function is locally quadratic. The classic Newton's method is initialized by a point from these regions, aiming to converge rapidly to a local minimum. Utilizing properly the found local minima, new regions are arisen, and, finally, the proposed procedure converges to a global minimum of the objective function. The overall approach intends to produce "good" initial points for the classic Newton's method, as well as, to provide a certainty in finding a global minimum utilizing an interval methodology. In addition, the used interval methodology is enhanced by the speed and the low-cost behavior of the real Newton's method. The above assertions are verified by the stated numerical results.